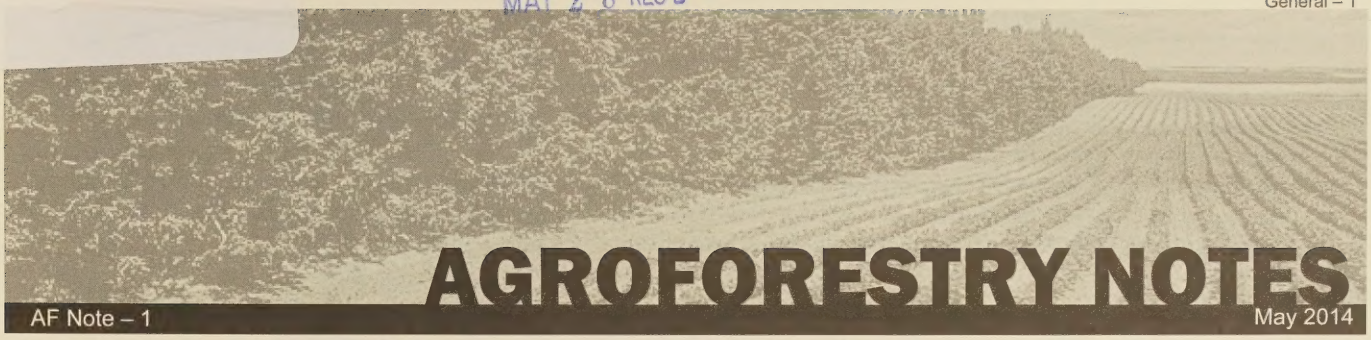


AGROFORESTRY NOTES

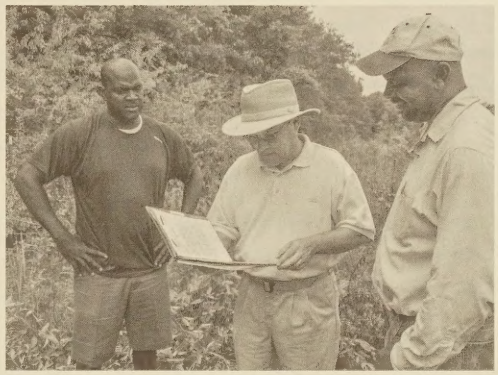
AF Note – 1

May 2014

An Overview of Agroforestry

Introduction

Agroforestry is a management system that combines agriculture and trees to address conservation needs and build more profitable and weather-resilient farms, ranches and communities. Agroforestry practices provide opportunities to integrate productivity and profitability with environmental stewardship resulting in healthy and sustainable agricultural systems that can be passed on to future generations.



USDA NRCS PHOTO

NRCS District Conservationist speaks with landowners about their forest management plan.

Trees and shrubs can be included into agricultural systems in many ways. Depending on the situation and application, agroforestry practices can: 1) provide protection for valuable topsoil, livestock, crops, and wildlife; 2) increase productivity of agricultural and horticultural crops; 3) reduce inputs of energy and chemicals; 4) increase water use efficiency of plants and animals; 5) improve water quality; 6) diversify local economies and on-farm income; 7) enhance biodiversity; 8) improve air quality and sequester carbon and 9) support working lands at the landscape scale.

Agroforestry can help reduce conflict between rural and urban land uses by creating "ecobelts" that serve as a zone of transition and help to reconnect agriculture, people, and communities. Applying these practices at a landscape scale is to creates a more functional landscape that can contribute to the quality of life for many people.

Economic Benefits

Enhance Production: In agricultural fields, orchards, vineyards and vegetable fields sheltered by agroforestry systems, crops have less bruising, scarring, and insect problems, and in many cases improved growth rates and higher yields.

Income Diversification: Agroforestry can provide additional income streams for farms and ranches and potentially increase crop yields per acre while conserving natural resources.

Environmental Benefits

Water Quality: Agroforestry systems can filter rainfall runoff laden with sediment, nutrient, chemical, and biological contaminants and help protect stream banks from erosion by flood waters. The result is cleaner water for communities and wildlife. Agroforestry can help address landscape-scale water quality issues such as hypoxia in the Gulf of Mexico and Chesapeake Bay.

Soil Quality: Agroforestry systems can improve soil quality while reducing or minimizing wind and water soil erosion. Woody roots in agroforestry systems increase water infiltration, add organic carbon to the soil, recycle nutrients and improve nutrient retention.

Wildlife Habitat: Populations of many wildlife species often increase with the addition of agroforestry systems in urban and agricultural areas, which in turn provides opportunities for recreational uses, such as bird-watching, hunting and hiking. In addition, agroforestry practices can increase the overall diversity of plants and physical structure in a landscape and as a result provide improved habitat for native pollinators.

Climate Change Adaptation, Mitigation and Carbon Sequestration: Woody plants sequester significant amounts of carbon and simultaneously increase the resilience of working lands to the impacts of droughts and floods, which may be increasing due to changing climate.

Energy Conservation: Agroforestry systems can significantly reduce home heating/cooling needs, reduce the need for snow removal and reduce irrigation needs, all of which save fuel.

Air Quality: The leaves and branches of trees and shrubs in agroforestry systems help filter and absorb air pollutants, create shade and cooler temperatures, and may help mitigate air quality impacts of livestock and industrial odors.

Social Benefits

Building Networks and Community: Through exchanging information about agroforestry, landowners can learn from one another about new practices and the resources available to implement them. Multiple landowners growing the same products may choose to work together to process or market these goods. Processing equipment can be purchased cooperatively or landowners can carry out market research and marketing together.

Jobs: Adding agroforestry practices to a farm or ranching enterprise can strengthen the resilience of that economic enterprise to fluctuations and changes by diversifying its income. In turn, this resilience can help maintain and create jobs.

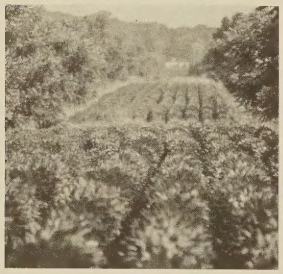
Quality of Life: Agroforestry systems are beneficial to farms, ranches, and communities, where these systems can protect soil, water, wildlife, roads, and buildings, in addition to reducing noise, moderating odors, lessening wind and filtering dust.

Visual Quality: Agroforestry systems can add variety to the landscape, screen undesirable views and provide recreational opportunities for viewing wildlife.

Agroforestry Systems

Agroforestry can be tailored to work in almost any resource situation. The multitude of agroforestry systems and their design variations can be put into six basic categories: 1) alley cropping; 2) windbreaks; 3) riparian forest buffers; 4) silvopasture; 5) forest farming; and 6) special practices. Understanding the basics of these practices is the first step toward creating and managing an sustainable agroforestry system.

Alley Cropping



Alley cropping can be designed to fit many farming and ranching situations. These systems are created by planting single or multiple tree rows at a predetermined spacing. The space between the rows is the alley where agricultural or horticultural crops are planted. In alley cropping, an agricultural crop is grown simultaneously with a long-term tree crop to provide annual income while the tree crop matures. Hardwoods, like walnut, oak, ash, and pecan, are favored species and can potentially provide high-value lumber or veneer logs. Nut crops, such as hazelnut, pecan, walnut, and chestnut can be an intermediate product. Short rotation biomass or forages can also be incorporated into the design.

Events in U.S. Agroforestry (1900 - Present)

Before 1900

Traditional ecological knowledge that many indigenous groups use in managing land include many practices that could be labeled agroforestry. In tropical regions, such as Hawaii and other Pacific Islands, agroforestry has been widely practiced for centuries and is still used today.

1914

J. Russell Smith, an economic geographer at Columbia University, advocated the use of permanent tree-protected systems to maximize production on arable lands. Smith's book, Tree Crops: A Permanent Agriculture provides many ideas that are still relevant today.

1930

The Great Depression and "Dust Bowl" spurred the U.S. Congress to authorize the Prairie States Forestry Project to plant windbreaks, which resulted in reconsideration of agricultural policies and supported research in agroforestry.

1960s-1970s

Interest in trees and their potential role in food production and soil conservation increased, after a decrease in the post war technology boom.

Windbreaks

Windbreaks are linear plantings of trees and shrubs designed to enhance crop production, protect people and livestock, and benefit soil and water conservation. There are several types of windbreaks. Field windbreaks protect wind-sensitive crops, control wind erosion, and increase bee pollination and pesticide effectiveness. Livestock windbreaks help reduce animal stress and mortality, reduce feed consumption, and help reduce visual impacts and odors. Living snow fences keep roads clear of drifting snow and increase driving safety. Windbreaks can also spread snow evenly across a field, increasing spring soil moisture.

Riparian Forest Buffers

Riparian forest buffers are strips of vegetation, including trees and shrubs, alongside streams, lakes, wetlands, ponds, and drainage ditches. These buffers intercept sediment, nutrients, pesticides and other materials in surface runoff and in shallow subsurface water flow so they don't get into the waterways. Temperatures in cold water streams can be maintained with shade from trees along their banks. Woody vegetation also reduces bank erosion by absorbing energy from stream action and by the roots holding soil in place. Some tree and shrub species can be managed in a riparian forest buffer for timber, wood fiber, bioenergy fuels, and horticultural and non-timber forest products. The inclusion of woody plants into an agricultural landscape also increases biodiversity and habitat diversity.

Silvopasture

Silvopastures combine trees, livestock and forages on the same acreage. With this approach, the trees create a favorable microclimate condition for growing forage (pasture or hay), reduces heat for livestock, while the trees grow wood or other products. Although currently practiced mostly in the southern and western United States, integrated forestry and livestock systems are gaining interest everywhere. Silvopasture can be established by thinning existing tree plantations or by planting trees into existing pastures. Some nut and fruit orchards may also be grazed.

Forest Farming

Forest farming or multi-story cropping adds an agricultural quality to the woodlands. Forest farming is the cultivation of high-value non-timber forest products under the protection of a forest canopy that has been modified to provide the correct shade level. Crops like ginseng, shiitake mushrooms, maple syrup, saw tooth palmetto, and decorative ferns are sold for medicinal, culinary, and ornamental uses. Forest farming often provides income while high-quality trees are being grown for wood products.

Special Practices

The principles and designs of different agroforestry practices can be utilized in non-agricultural and non-forested situations. For example, the science and experience of using riparian forest buffers is being used in urban areas to address storm water quantity and quality issues. Similarly, forest farming techniques are being used to grow food in parks and backyards. Some special applications include the utilization of wastewater or irrigation tailwater to irrigate the trees and shrubs. Any agroforestry practice can be designed to enhance wildlife habitat and to optimize carbon storage.

1980s

Renewed interest in agroforestry's potential in the temperate U.S. gained the attention of academic institutions, government agencies, and other organizations.

1990

In the 1990 Farm Bill, Congress authorized the establishment of the USDA Forest Service's "Semiarid Agroforestry Research, Development, and Demonstration Center." In 1995, this became a partnership with USDA's Natural Resources Conservation Service and broadened its mission to cover the entire US. It's name changed to the USDA Notional Agroforestry Center.

1998

The University of Missouri started the Center for Agroforestry, which provides research and education on agroforestry systems.

2000s

In 2004, the 1890 Land-Grant Universities formed the 1890 Agroforestry Consortium along with NAC. In 2011 the University of Missouri began an online master's program in agroforestry and later a 12 hour graduate certificate in agroforestry.

The Future

The United States is well positioned for an expanded application of agroforestry to address America's most pressing economic, environmental, and social priorities, including jobs and rural prosperity, cleaner water for communities and downstream ecosystems, climate-resilient working landscapes, a safe, secure and nutritious food supply, and improved habitat/corridors for wildlife. Agroforestry's importance in the 21st century will increase both in the U.S. and globally as a means to sustainably produce the food, fiber, and bioenergy demanded by a world-wide population that is expected to exceed 9 billion people by 2050. The scientific basis for agroforestry in temperate North America has made great advances, but more tailored science-based tools are needed to address a wide range of issues and opportunities across all lands. Agroforestry can and should become part of an all-lands approach to conservation and economic development that is applicable throughout the rural to urban continuum and in all regions of the country. Leadership, partnerships, and active engagement among government agencies, universities, landowners, producers, and other organizations will be essential to realize a significant 21st century expansion of agroforestry and its many benefits.

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USDA National Agroforestry Center

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United States Forest Service
Natural Resources Conservation Service

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The USDA National Agroforestry Center (NAC) is a partnership of the Forest Service (Research & Development and State & Private Forestry) and the Natural Resources Conservation Service. NAC's staffs are located at the University of Nebraska, Lincoln, NE and in Blacksburg, VA. NAC's purpose is to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land use systems by working with a national network of partners and cooperators to conduct research develop technologies and tools, establish demonstrations, and provide useful information to natural resource professionals.

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